

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
**(Chapter II of the Patent Cooperation Treaty)**

(PCT Article 36 and Rule 70)

|   |  |  |                       |
|---|--|--|-----------------------|
| Applicant's or agent's file reference<br>11276P-WO  | <b>FOR FURTHER ACTION</b>  |  | See Form PCT/IPEA/416 |
| International application No.<br>PCT/EP2004/010078  | International filing date (day/month/year)<br>09.09.2004                 | Priority date (day/month/year)<br>12.09.2003 |                       |
| International Patent Classification (IPC) or national classification and IPC<br>H01J37/18, H01J37/26  |  |  |                       |
| Applicant<br>ICT INTEGRATED CIRCUIT TESTING... et al.   |  |  |                       |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 4 (claims 1-20) sheets, as follows:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)), containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> |  |  |                       |
| <p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the opinion</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>   |  |  |                       |
| Date of submission of the demand<br>20.04.2005  | Date of completion of this report<br>13.06.2005                          |  |                       |
| Name and mailing address of the International Preliminary examining authority:<br><br><br>European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465  | Authorized Officer<br><br>Centmayer, F<br>Telephone No. +49 89 2399-2167 |  |                       |

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**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2004/010078

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
    - international search (under Rules 12.3 and 23.1(b))
    - publication of the international application (under Rule 12.4)
    - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

**Description, Pages**

1-14 as originally filed

**Claims, Numbers**

1-20 received on 20.04.2005 with letter of 20.04.2005

**Drawings, Sheets**

1/5-5/5 as originally filed

- a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):
4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed; as indicated in the Supplemental Box (Rule 70.2(c)).
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2004/010078

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

|                               |      |        |      |
|-------------------------------|------|--------|------|
| Novelty (N)                   | Yes: | Claims | 1-20 |
|                               | No:  | Claims |      |
| Inventive step (IS)           | Yes: | Claims | 1-20 |
|                               | No:  | Claims |      |
| Industrial applicability (IA) | Yes: | Claims | 1-20 |
|                               | No:  | Claims |      |

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

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**Box No. VII Certain defects in the international application**

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The following defects in the form or contents of the international application have been noted:

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.  
**PCT/EP2004/010078**

Reference is made to the following documents:

D1: DE-A-100 32 607

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or  
industrial applicability; citations and explanations supporting such  
statement**

1. D1 (see in particular the places indicated in the Search report) describes a charged particle emission component for providing a charged particle beam, comprising a first UHV region (Druckbereich 3) comprising an emitter (3, FE-Strahler) for emitting the beam of charged particles, a second UHV region (Druckbereich 2 or 1) and a residual gas diffusion barrier (9) separating the first and the second UHV region.

The charged particle emission component of claim 1 is different from the device of D1 in that the first and the second UHV region each have a vacuum flange and that the first UHV region does not comprise elements, which essentially block a portion of the charged particle beam.

The charged particle emission component according to claim 1 is therefore new (Art. 33 (2) PCT).

Devices for UHV are normally assembled by vacuum flanges.

The problem to be solved by the present invention may be regarded as

providing a charged particle emission component in which no unwanted ions, ionized molecules and other particles are generated which can damage the emitter (page 1, line 25 to page 2, line 10).

This is achieved in that the first UHV region does not comprise elements, which essentially block a portion of the charged particle beam.

This feature is not disclosed or suggested in any of the documents cited in the Search Report.

The solution to the above problem proposed in claim 1 of the present application is therefore considered as involving an inventive step (Article 33(3) PCT).

2. It appears that claim 18 relates to the operation of a device with an emitter in the first UHV region.

A person skilled in the art can choose appropriate pressures in the pressure regions mentioned.

The documents cited in the Search report do however not disclose or suggest to operate a charged particle beam device with an emitter in a first UHV region such that the charged particle beam is essentially not blocked within the first UHV region.

The method according to claim 18 is therefore considered as new (Article 33(2) PCT) and involving an inventive step (Article 33(3) PCT).

3. Claim 13 which comprises all the features of claim 1 meets also the requirements of the PCT with respect to novelty and inventive step. Claims 2-12, 14-17 and 19,20 are dependent on claims 1,13 or 18 and

as such also meet the requirements of the PCT with respect to novelty and inventive step.

**Re Item VIII**

**Certain observations on the international application**

Claim 18 is not clear because it is not stated whether the charged particle beam device comprises an emitter , and if so, where this emitter is situated. This is essential with regard to the technical problem to be solved (see point 1 above).

Independent claims 1, 13 and 18 are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

Claim 13 comprises all the features of claim 1 and should therefore be drafted as a dependent claim (Rule 6.4 PCT).

**Re Item VII**

**Certain defects in the international application**

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

## CLAIMS

1. Charged particle emission component for providing a charged particle beam, comprising:
    - 5 a first UHV region (102);
    - a second UHV region (104); and
    - a residual gas diffusion barrier (106; 206) separating the first and the second UHV region;
    - 10 whereby the first UHV region does not comprise elements, which essentially block a portion of the charged particle beam; and
    - wherein the first and the second UHV region (102, 104) each have a vacuum flange (102a, 104a), and further comprising an emitter (16) in the first UHV region for emitting the beam of charged particles (17).
  - 15 2. Charged particle emission component according to any of the preceding claims, further comprising an aperture unit (110) for differential pumping between the emission component and a further chamber (112) of a charged particle beam column.
  - 20 3. Charged particle emission component according to any of the preceding claims, whereby the residual gas diffusion barrier has an opening (107) with a diameter larger than the diameter corresponding to the beam emission angle; preferably with a diameter corresponding to a beam emission angle of minimal 10°.
  - 25 4. Charged particle emission component according to any of the preceding claims, wherein the residual gas diffusion barrier (106; 206) has an opening (107) for the charged particle beam, the opening has a size of at least 1 mm, preferably of at least above 5mm.
  - 30 5. Charged particle emission component according to any of the preceding claims, wherein the residual gas diffusion barrier acts (106; 206) as an extraction electrode for extracting or modulating the emitted charged particles.

6. Charged particle emission component according to any of the preceding claims, further comprising at least one beam shaping element (109; 18; 108; 402) in the second UHV region (104), wherein the at least one beam shaping element blocks a portion of the charged particle beam by having an opening for the charged particle beam, the opening has a size corresponding to a beam emission angle of below 5°, preferably of below 1°.
7. Charged particle emission component according to any of the preceding claims 7, wherein the first and the second UHV region have in operation a pressure of maximal  $10^{-8}$  mbar.
8. Charged particle emission component according to any of the preceding claims, wherein the first and the second UHV region have in operation a pressure difference of maximal one magnitude.
9. Charged particle emission component according to any of the preceding claims, wherein the amount of charged particles impinging on surfaces located in the first UHV region is maximal 20 % of the amount of charged particles impinging on surfaces located in the emission component.
10. Charged particle emission component according to any of the preceding claims, wherein the first vacuum flange (102a) corresponding to the first UHV region (102) and the second vacuum flange (104a) corresponding to the second UHV region (104) are connected to one vacuum pump (502).
11. Charged particle emission component according to any of the preceding claims, wherein the first vacuum flange corresponding to the first UHV region and the second vacuum flange corresponding to the second UHV region are connected to separate vacuum pumps (502a, 502b).
12. Charged particle emission component according to any of the preceding claims, wherein the residual gas diffusion barrier is an isolating aperture and the first and the second UHV regions are UHV chambers.

13. Charged particle emission component for providing a charged particle beam, comprising:  
a housing (101) of the charged particle emission component;  
an emitter (16) for emitting a beam of charged particles (17) with a beam emission angle;  
5 at least one beam shaping element (109; 18; 108; 402); and  
a residual gas diffusion barrier (106; 206) directly subsequent to the emitter, whereby the residual gas diffusion barrier separates the charged particle emission component in a first and a second UHV region,  
10 whereby the residual gas diffusion barrier has an opening (107) with a diameter larger than the diameter corresponding to the beam emission angle; and  
wherein the first and the second UHV region (102, 104) each have a vacuum flange (102a, 104a).
- 15
14. Charged particle emission component according to claim 13, whereby the first UHV region does not comprise elements, which essentially block a portion of the charged particle beam.
- 20 15. Charged particle emission component according to any of claims 13 to 14, further comprising any of the features of claims 1 to 12.
- 25
16. Charged particle emission component according to any of claims 1 to 15, wherein the surfaces of the first UHV region are the surfaces of at least the following components:  
the emitter (16),  
the residual gas diffusion barrier,  
the part of the emission component housing (101) corresponding to the first UHV region, and
- 30 and wherein the surfaces of the second UHV region are the surfaces of at least the following components:

the at least one beam shaping element,  
the differential pumping aperture (109; 18; 108; 402),  
the part of an emission component housing corresponding to the  
5 second UHV region.

17. Charged particle beam device comprises a charged particle emission component according to any of the preceding claims.
- 10 18. Method of operating a charged particle beam device, comprising the steps of:  
evacuating a first UHV region to a pressure of maximal  $10^{-8}$  mbar;  
evacuating a second UHV region to a pressure of maximal  $10^{-8}$  mbar;  
15 evacuating at least a further chamber to a pressure of maximal  $10^{-5}$  mbar; and  
emitting a charged particle beam such that a portion of the charged particle beam is essentially not blocked within the first UHV region.
19. Method of operating a charged particle beam device according to claim 18, whereby  
20 the charged particles are emitted with an emission angle such that the amount of charged particles impinging on surfaces located in the first UHV region is maximal 20 % of the amount of charged particles impinging on surfaces located in the first and the second UHV region.
- 25 20. Method of operating a charged particle beam device according to any of claims 18 to 19, whereby  
a portion of the beam is blocked in the second UHV region, such that the beam is shaped.

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